4-25-1984

VW Aircraft Propeller Unit

Khris L. Wright
Indiana University - Purdue University Fort Wayne

MET (IET) 497
SENIOR DESIGN PROJECTS
PROFESSOR DONALD J. MC ALEECE
SPRING 1984

VW AIRCRAFT PROPELLER UNIT

by

KHRIS L. WRIGHT

VW AIRCRAFT

PROPELLER UNIT

Prepared For
Mr. Donald J. McAleece
Manufacturing Technology Instructor
Purdue University
Fort Wayne, Indiana

by

Khris L. Wright

April 25, 1984

Descriptive Abstract

The current homebuilt aircraft movement has created a demand for a low horsepower, light weight engine. The VW flat four automotive engine has filled this demand, but the VW engine is not safe for more than basic aerobatic manuvers. The VW Aircraft Propeller Unit allows for aggressive, full speed aerobatic manuvers by removing propeller loads from the crankshaft.

INFORMATIVE ABSTRACT

The VW Aircraft Propeller Unit is meant to make the VW aircraft engine safe for aerobatic manuvers. The unit removes all loads but torque loads from the crankshaft and transfers them directly to the crankcase. The propeller unit also provides crankshaft protection from propeller strikes through a shear key assembly.

The unit consists of six separate parts; the drive hub, shear key, propeller shaft, bearings, bearing blocks and side plates. The drive hub transmits the power from the engine to the propeller shaft. The drive hub is fabricated from 1035 steel and is designed to carry a 65 hp load with a factor of safety of 8.4. The shear key is the connection between the drive hub and the propeller shaft. The shear key must carry the propeller torque loads but be able to shear in case of a propeller strike. The shear key is 6061-T6 aluminum and is designed with a factor of safety of over 3, but is fragile enough to shear under the kenetic energy stored by the crankshaft assembly, which is 2574 ft-lbs.

The most critical part of the unit is the propeller shaft. The propeller shaft is fabricated from 4340 steel because its extremely high strength and fatigue resistance allows a thinner wall section. The shaft resists a 10,000 in-lb bending moment with a factor of safety of 2.72 over the fatigue strength.

The bearings must carry 1670 pounds of radial load and 120 pounds of thrust load. The rear ball bearing carries all of the 120 pound thrust load and a 1670 pound radial load. The front roller bearing

carries only the 1670 pound radial load. Both bearings will carry these loads for more than 1500 hours of L_{10} life. The bearings are mounted into bearing blocks fabricated of 6061-T6 aluminum. The blocks are designed with a minimum factor of safety of 4.6.

The side plates bring everything together and mount the unit to the engine. The side plates are constructed of 6061-T6 aluminum and have a minimum factor of safety of over 42. The very low stress in the side plates assures negligible deflections.

TABLE OF CONTENTS

TABLE OF CONTENTS (CONT'D)